Board of Education Agenda Item

Item: _____ M. _____   **Date:**   October 25, 2006

Topic: First Review of a Proposal to Develop Standards of Learning for a New, Optional High School Mathematics Course

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Origin:

_____ Topic presented for information only (no board action required)
_____ Board review required by state or federal law or regulation
__X__ Board of Education regulation
_____ Other: _____

__X__ Action requested at this meeting   _____ Action requested at future meeting:

Previous Review/Action:
__X__ No previous board review/action

_____ Previous review/action
       date   _____
       action   _____

Background Information: Recent research indicates that many students would benefit from additional instruction in the areas of algebra and data analysis as they prepare to enter postsecondary instruction and work. Achieve, The Education Trust, and the Thomas B. Fordham Foundation worked with two- and four-year postsecondary faculty and front-line managers in high-growth, high-skill occupations to define the core knowledge and skills that high school graduates need to succeed in these kinds of occupations. Among the skills required is a critical understanding of higher levels of algebra and data analysis.

Recognizing that some students need additional time and instruction to gain these skills, in May 2006 the Department of Education convened a representative statewide group of stakeholders to discuss the desirability of creating a new mathematics course focusing on the advanced study of relations, functions, and data analysis. During this same time frame, professionals involved in mathematics education in Virginia were informally polled about this topic. Respondents indicated that there appears to be a gap in Virginia's course offerings that could be filled by a course focusing on advanced study of relations, functions, and data analysis.

In response to this research and observations from the field, the Department of Education is proposing the development of Standards of Learning for a new, optional high school course in mathematics, "Algebra and Data Analysis."

Summary of Major Elements: The Department of Education proposes to develop Standards of Learning for a new, optional mathematics course. The potential new offering, tentatively titled, "Algebra and Data Analysis," would assist students to build advanced conceptual models useful for developing more sophisticated mathematical foundations in preparation for higher level mathematics coursework. The new course would help students to:

- model real world phenomena using algebra;
- analyze and represent algebraic relationships and functions using tables, equations, and graphs;
- translate easily between representations of functions;
- select and use appropriate statistical methods to analyze data; and
- develop and evaluate inferences and predictions that are based on data.

The course would be above the level of algebra and geometry.

Attachment A contains a timeline for the development of the *Standards of Learning* and Curriculum Framework for the course. Attachment B contains a brief description of the course.

Superintendent's Recommendation: The Superintendent of Public Instruction recommends that the Board of Education waive first review and authorize the Department to proceed with the development of *Standards of Learning* for a new, optional mathematics course, tentatively titled "Algebra and Data Analysis."

Impact on Resources: The resources needed to develop the standards and the curriculum framework for this course may be absorbed by the Department's existing resources at this time. School divisions implementing the proposed course would need to provide textbooks and other instructional materials for students.

Timetable for Further Review/Action: The Department of Education proposes to develop a set of *Standards of Learning* for the new course to present to the Board for approval in early 2007. Subsequent to approval of the new standards by the Board, a curriculum framework would be developed.

Proposed Schedule for the Development and Approval
of *Standards of Learning* for "Algebra and Data Analysis"

November 2006 -   *Standards of Learning* development committee meets to draft standards
January 2007   for a new course, "Algebra and Data Analysis."

February 2007   Draft of the proposed *Standards of Learning* goes to the Board for first review.

March 2007   A Superintendent's Memorandum is distributed to announce:
- the public comment period;
- public hearings; and
- the availability of a *Standards of Learning* comment page on the
  Virginia Department of Education (VDOE) Web site during the public
  comment period.

The VDOE posts on its Web site a *Standards of Learning* comment
page for "Algebra and Data Analysis." The page will be active for 30 days.

April 2007   Public hearings are held to take comment on the proposed *Standards of
                           Learning*.

May 2007   The VDOE aggregates and conducts a preliminary analysis of the
                           comments entered on the Web page and comments made at public hearings.

June 2007   The VDOE presents the proposed *Standards of Learning* to the Board for
                           final review.

July - September   The development committee meets to draft the curriculum framework for the
2007   approved course, "Algebra and Data Analysis."

October 2007   The proposed curriculum framework for "Algebra and Data Analysis" goes
                           to the Board for first review.

November 2007   A Superintendent's Memorandum is distributed to announce:
- the public comment period;
- public hearings; and
- the availability of a curriculum framework comment page on the
  Virginia Department of Education Web site during the public
  comment period.

The VDOE posts on its Web site a curriculum framework comment page for
"Algebra and Data Analysis." The page will be active for 30 days.

December 2007 -   The VDOE aggregates and conducts a preliminary analysis of the comments
March 2008   entered on the Web page and comments made at public hearings.

April 2008   The curriculum framework goes to the Board for final review.

Algebra and Data Analysis
Standards of Learning
Course Development Outline

The content of "Algebra and Data Analysis" could include (but not be limited to):

- data analysis
  - summary statistics
  - characteristics of the Gaussian normal distribution
  - sampling methods and bias
  - simple experimental design
  - elementary probability
- function families
  - linear functions
  - quadratic functions
  - exponential functions
  - logarithmic functions
- functional behavior analysis in context
  - decreasing and increasing functions;
  - rate of change;
  - zeros of function;
  - relative and absolute maxima and minima;
  - interpreting y-intercept in context;
  - function discontinuities;
  - domain and range;
  - multiple representations; and
  - finite differences.
- direct and inverse variation
- systems of equations
- linear programming
- graph theory and network flows
- transformations

Instruction in "Algebra and Data Analysis" should be viewed as assisting students to build conceptual models that are useful at helping develop more sophisticated conceptual structures and methods. This involves:

- modeling real world phenomena using algebra;
- analyzing and representing algebraic relationships and functions using tables, equations, and graphs;
- translating easily between representations of functions;
- selecting and using appropriate statistical methods to analyze data; and
- developing and evaluating inferences and predictions that are based on data.

To this end, students should interact with engaging problems that invite data exploration to generate a function rule that best models the situation. In so doing, students' understanding of algebraic and geometric concepts and skills is enhanced.